Michigan Clean Fleet Conference
Panel Discussion: Alternative Fuels

March 22, 2006

Energy Policy Act of 1992

- Started Model Year 1997
- Federal, State and Alternative Fuel Providers
- 50 or more light duty vehicles (LDV) and 20 or more can be centrally fueled
- 90% of light-duty buys have to be alternative fueled

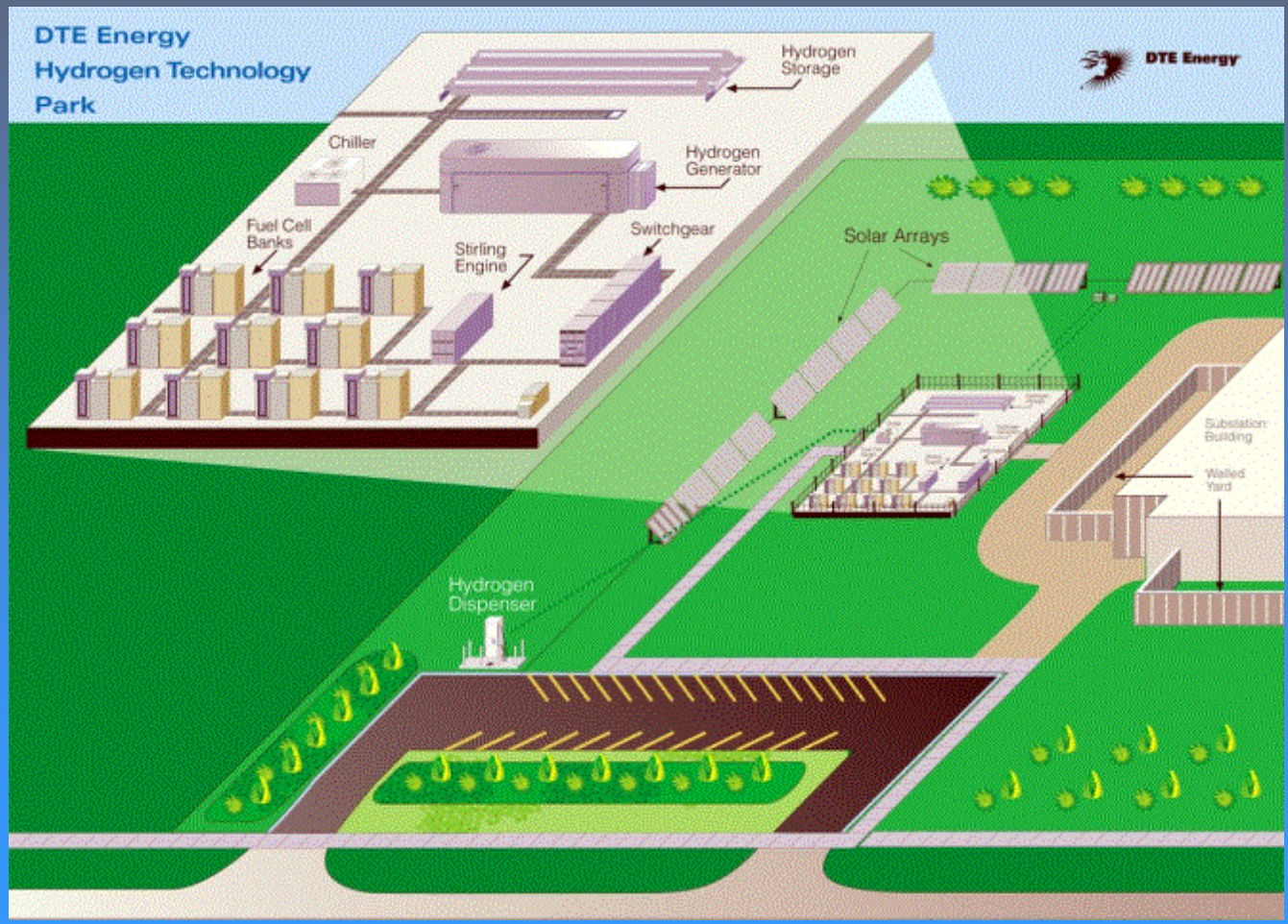
Qualified Alternative Fuels

- Electricity
- Natural Gas (Compressed or Liquefied)
- Propane
- E85
- Methanol
- Biodiesel (added Jan. 2001)
- Hydrogen

Hydrogen Project Overview

System Attributes:

- End-to-end hydrogen energy system
- Electrolysis-based hydrogen production
- On-site renewable energy source
- Fuel cell-based power generation
- Vehicle re-fueling
- Remotely operated & controlled



Southfield, MI

Objectives

- **Demonstrate an end-to-end, multi-use hydrogen energy station in order to**:
  - **Test on-site, co-production of hydrogen for stationary fuel cell power and vehicle fueling applications**
  - **Identify the technical and economic drivers of system performance**
  - **Validate component and system technologies**
- **Develop applications experience in hydrogen energy systems**
- **Contribute to development of relevant safety standards and protocols for hydrogen-based power systems.**
- **Evaluate the market opportunities for hydrogen energy systems.**
- **Educate the public on hydrogen-based energy systems**.

Interactions & Collaborations

- **Lawrence Technological University**
  - **Data collection & analysis**
  - **Project to serve as 'working laboratory' in new alternative energy curriculum**
- **University of Michigan**
  - **Economic Model**
  - **Market Assessment**
- **BP**
  - **Infrastructure partner for DOE Hydrogen Fleet Demonstration project**
  - **Providing best practices/lessons learned from EU and other hydrogen refueling installation experiences**
- **DaimlerChrysler**
  - **Vehicle partner for DOE Hydrogen Fleet Demonstration project**

DAIMLERCHRYSLER

LAWRENCE TECHNOLOGICAL UNIVERSITY
THEORY AND PRACTICE
1932
SOUTHFIELD, MICHIGAN

bp

MICHIGAN

Installed System

Dispenser

Hydrogen Customers

- **Inergy Automotive**
- **Daimler-Chrysler**
- **Wayne State University**
- **City of Farmington Hills**
- **Ford Motor Company**
- **City of Taylor**

CNG

- Compressed Natural Gas
- Stored in vehicles at 3,000 to 3,600 psi special tanks
- Fuel delivery system

CNG Safety

- Fuel
  - Natural Gas is lighter than air
  - Narrow combustion range 5%-15% gas to air ratio
  - High ignition temperature of approx. 1350 degrees F
  - Virtually non-carcinogenic
- Vehicle
  - Cylinders are safer than gasoline tanks
  - Crash tested
  - Lock-on fuel nozzle & check valves

CNG Fueling Stations

- Fast fill, publicly accessible sites
- Time fill, private fueling

Why CNG

- Economic Benefits
  - Price difference over gasoline
  - Availability of natural gas
  - Vehicle life & maintenance cost
- Environmental Benefits
  - Cleanest internal combustion engine
  - 90% reduction in reactive hydrocarbon, carbon monoxide & air toxin emissions
  - No liquid spills

Vehicle Options

- Original Equipment Manufacturer Product
  - GM & Honda
- Limited After-Market Conversions
- On-Road Product for Medium & Heavy Duty
- Off-Road Product Available for Tugs, Forklifts & Zamboni's

Look Who's Already Enjoying CNG

- DTE Energy
- Ford Motor
- General Motors
- Detroit DOT
- Airlines Parking
- E-Z Ride
- Washtenaw County
- Wayne County
- City of Ann Arbor
- Ann Arbor Public Schools
- East Lansing Police
- U.S. Government
- US Environmental Protection Agency
- Wayne State University
- State of Michigan
- U.S. Military
- Windsor Casinos
- Bluewater Transit
- U.S. Postal Service
- SEMCO Energy
- Eastern MI University
- Muskegon Transit Authority
- City of Taylor
- Consumers Energy
- City of Detroit
- USF Holland
- American Honda Motors

Alternative Fuel Questions

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